

**Georgia  
Tech**  
CREATING THE NEXT



# Energy Policy @Tech

Kaye Husbands Fealing, Chair

Marilyn A. Brown, Regents' Professor &  
Brook Byers Professor of Sustainable Systems

School of Public Policy

Georgia Tech Advisory Board Meeting  
28 September 2018

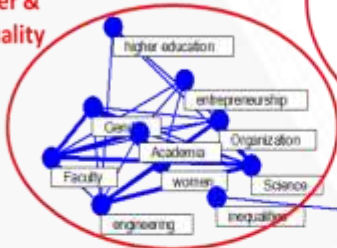
# Disciplines of Faculty in the Georgia Tech School of Public Policy

- 1. Business administration**
- 2. City and regional planning**
3. Communications
- 4. Economics**
- 5. Engineering**
- 6. Ethics**
- 7. Geography**
8. History and philosophy of science
9. Information systems
10. Law
- 11. Management and organizational theory**
- 12. Philosophy**
- 13. Political science**
- 14. Public affairs**
- 15. Public management**
16. Public policy
17. Science and technology studies
18. Sociology
19. Telecommunications policy
- 20. Theoretical high energy physics**

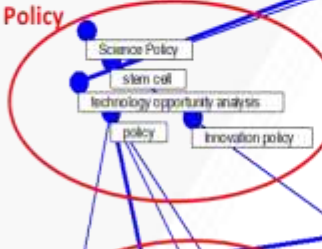
# Complex Web of Topics Define Georgia Tech's School of Public Policy



**Gender & Inequality**



**Policy Making & Technology Policy**



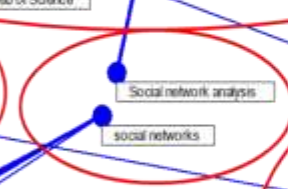
**ICT & Disabilities**



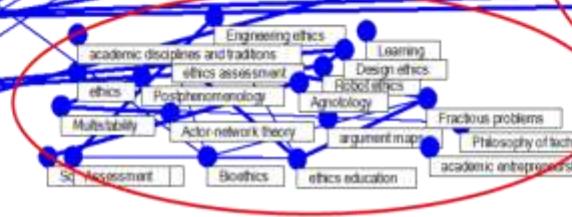
**Economics**



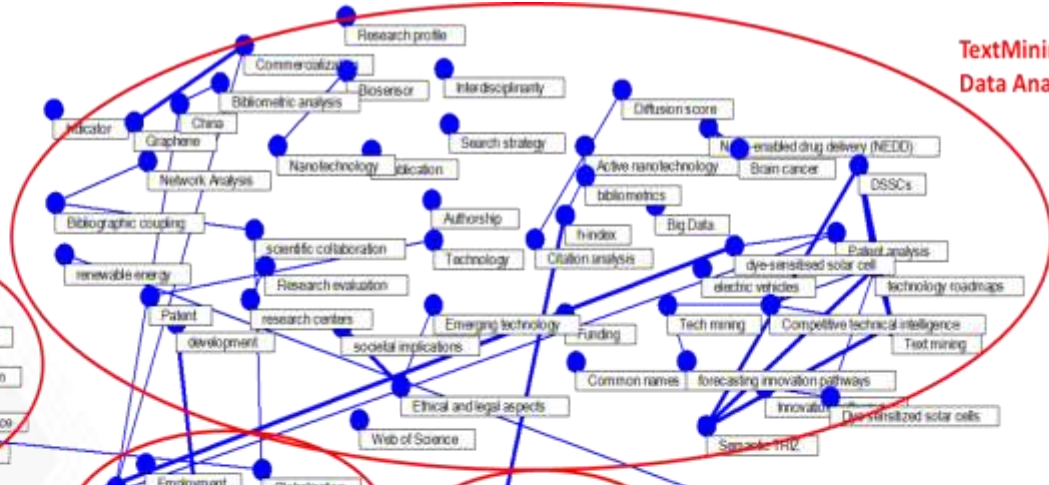
**Social Network Analysis**



**Ethics & Education**



**TextMining & Data Analytics**



**Climate & Energy Policy**



# Technology & Policy

## Some

- Biomedical ethics
- Cybersecurity policy
- **Energy & environmental policy**
- Data analytics
- Infrastructure & environmental sustainability

# Our Faculty in E&E Policy

U.S. News and World Report rated the Georgia Tech School of Public Policy (SPP) 12<sup>th</sup> in the nation in “Environmental Policy and Management”



**Omar Isaac Asensio**

Data Science  
Policy  
Management



**Marilyn Brown**

Energy policy modeling  
Smart Grid Policies  
Renewables and EVs



**Jennifer Clark**

Regional economics  
Industrial data



**Michael Elliott**

Environmental Planner  
Mediator



**Alice Favero**

Environmental economics  
Climate Policy  
Natural resource economics



**Scott Ganz**

Social organization  
Spatial economic analysis  
Impacts of carbon tax



**Emily Grubert**

Infrastructure policy  
Energy-water nexus  
Modeling societal values



**Gordon Kingsley**

Public Management  
Policy Partnerships  
Policy Implementation



**Emanuele Massetti**

Climate Change Economics  
Climate Policy



**Daniel Matisoff**

Environmental Policy  
Energy Policy Analysis



**Bryan Norton**

Sustainable Theory  
Sustainable Practice



**Michael Rodgers**

Transportation and Energy  
Air Quality  
Environmental Science



**Valerie Thomas**

Environmental Modeling  
Energy Modeling



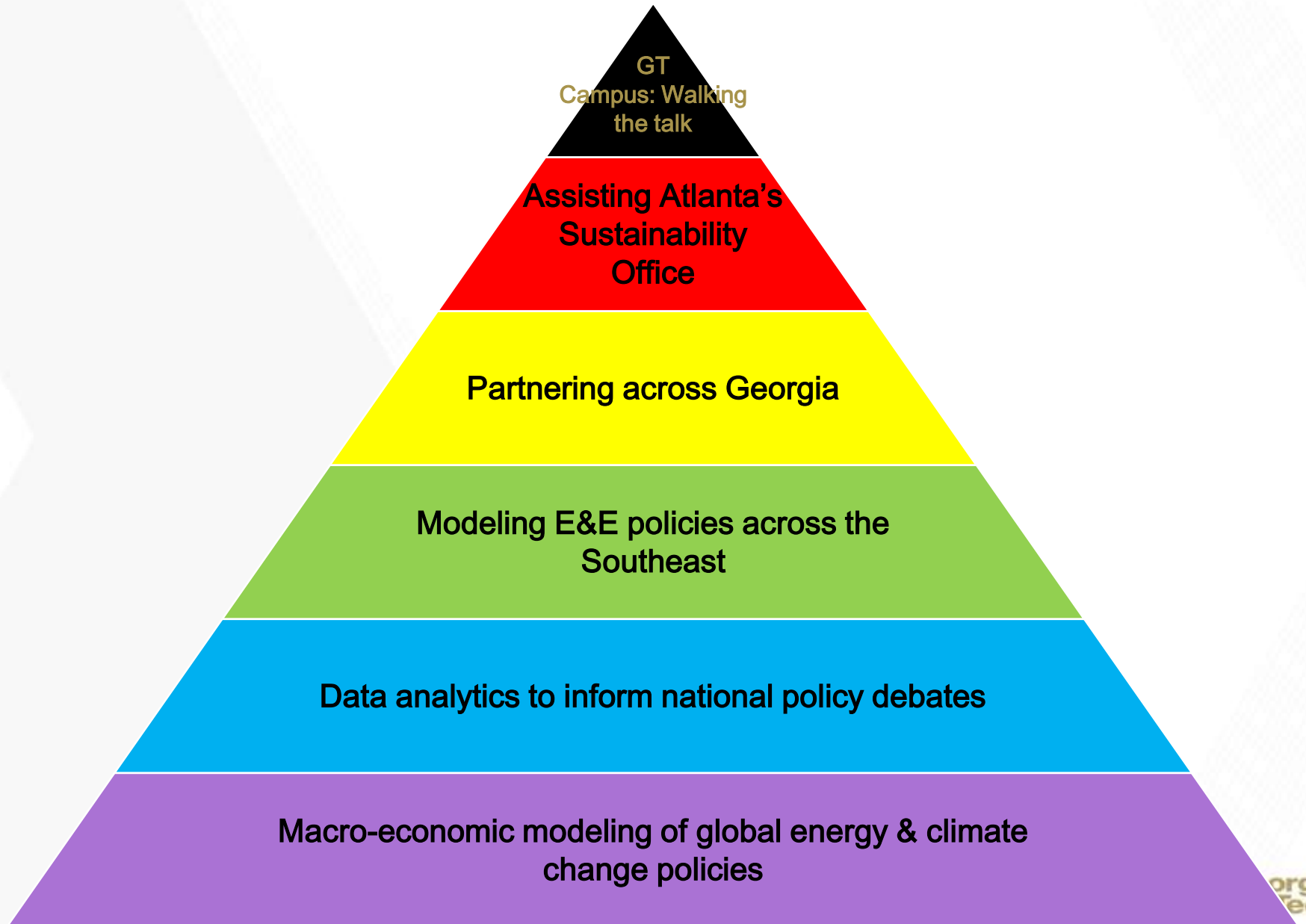
# Questions

- How Georgia Tech can help create a fertile policy landscape to use better technologies?
- How humans interact with the built and natural environments?
- How clean energy solutions can be employed in households and industry, and improve regional economic development?
- Why are least-cost options not employed?
- Where are the most efficient allocations of clean tech investments?
- How to engage life-long learners in energy and environmental sustainability?

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# Energy Policy: From Local-to-Global



The left side of the slide features a large, dark olive-green triangle pointing right. Inside this triangle is a faded, technical illustration of a mechanical or electrical system, possibly a control panel or engine component. Overlaid on this background is the Georgia Tech logo, which consists of the words "Georgia Tech" in a white, sans-serif font, with a small white icon of the Georgia Institute of Technology's tower to the right. Below the logo, the tagline "CREATING THE NEXT" is written in a smaller, white, all-caps, sans-serif font.

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# Georgia Tech

**Blending** Research & Curriculum



# The Living Building



- The **Kendeda** Fund generously gave \$30 million to fund the first Living Building in the Southeast – at Georgia Tech.
- It embodies the philosophy of the Living Building Challenge – to change how humans interact with the built environment.



How much PV is cost-effective?  
How can solutions be replicated

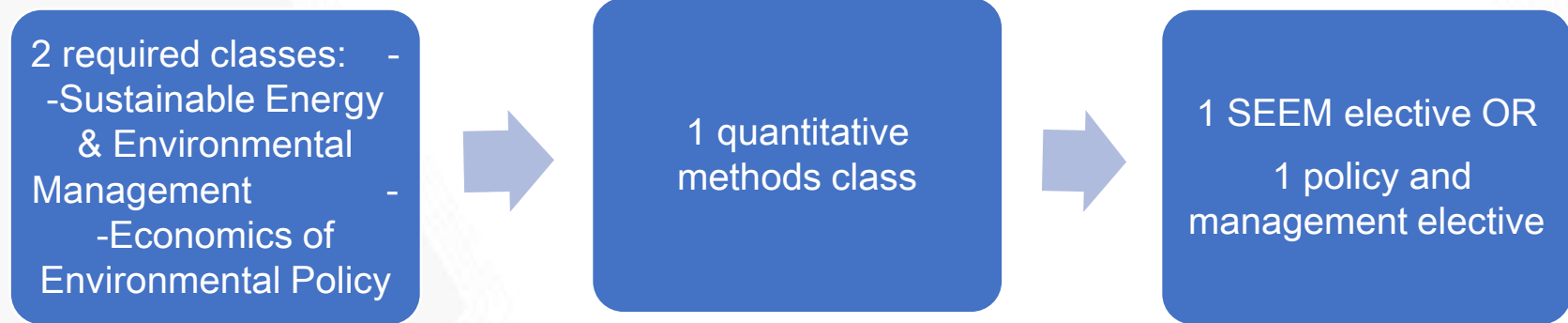
7 Petal Structure



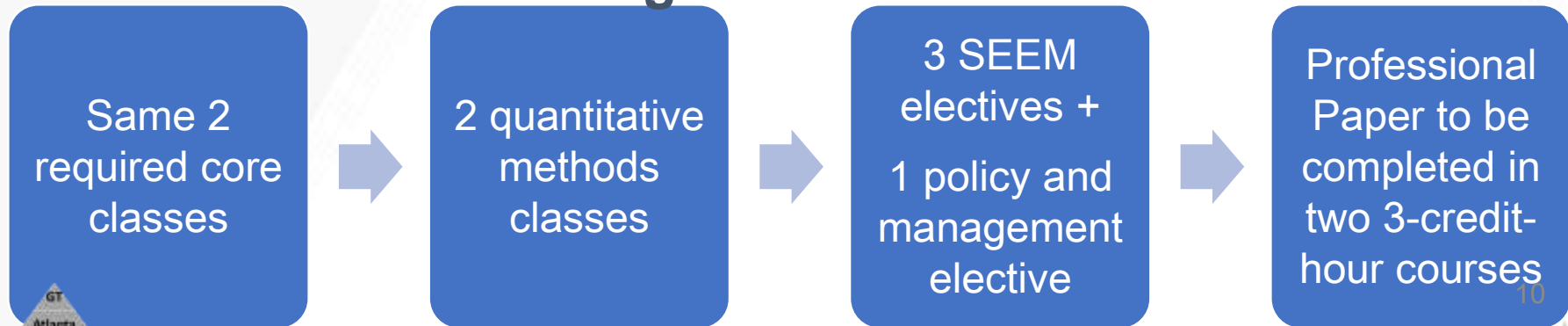
Alice Favero & Dan Matisoff

# Teaching Sustainability: Proposed New Degree & Certificate On-Campus and On-Line

## CSEEM: Certificate of Sustainable Energy and Environmental Management



## MSEEM: Master of Sustainable Energy and Environmental Management





## The Greater Atlanta Area

**Assisting** Atlanta's Sustainability Office

# SPP Has Enabled Atlanta's Clean Energy Leadership

- Co-founded and hosted the launch of the Southeast Energy Efficiency Alliance.
- Calculated the City's first Carbon Footprint.
- Modeled energy benchmarking, assisting with the first benchmarking ordinance the South.
- Hosted the first public discussion of “100% renewables” and co-hosted three town hall meetings to discuss energy futures.
- Helped bring sustainability funds to Atlanta (most recently the Bloomberg Foundation).
- The Greenlink Group (a spinoff from SPP) modeled the 100% Clean Energy goal for the City.



Valerie Thomas & Marilyn Brown

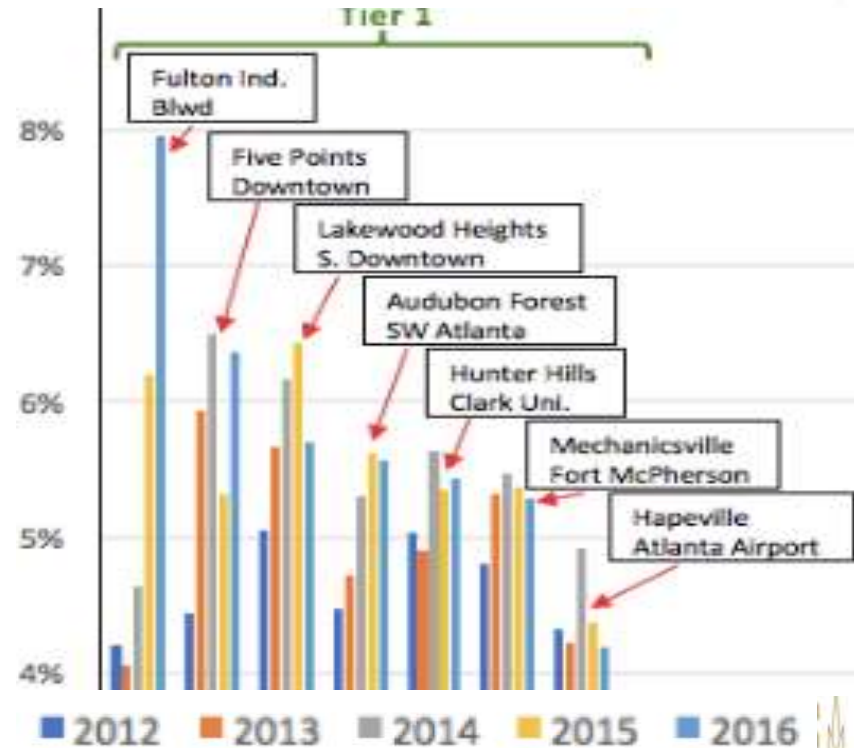
# Atlanta's Energy Burden is 3<sup>rd</sup> Highest in the Nation among Low-income Households

	All households	Low-income households*
1	Memphis (6.2%)	Memphis (13.2%)
2	Birmingham (5.3%)	Birmingham (10.9%)
3	New Orleans (5.3%)	Atlanta (10.2%)
4	Atlanta (5.0%)	New Orleans (9.8%)

- Energy burden is emerging as a “material” issue for investor-owned utilities.
- It influences the quality of life of our students in off-campus housing.
- The challenge is to convert “shared values” into solutions.

Data analytics combined with focus groups have help visualize and understand the problem.

Atlanta Electricity Burden by Zip Code







# Georgia

**Collaborating** on Smart Cities and Economic  
Development

# Georgia Tech's Smart Communities Challenge

- To spur smart community development throughout GA
- To position GA as a smart community leader
- To build a workforce familiar with advanced technologies

## Randomized Policy Experiments



Randomized  
Controlled  
Trials



Smart Grid and Energy  
Efficiency Program  
Evaluation



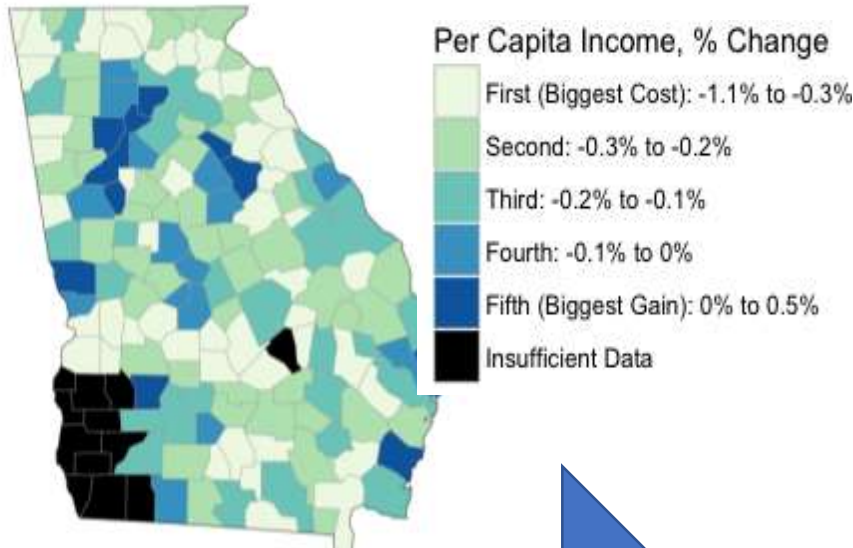
- SPP developed tools for the GA Environmental Leadership Program.
- SPP co-launched the Georgia Climate Project (with Emory and UGA).



Debra Lam, Omar Asensio & Marilyn Brown

# Who Wins and Who Loses from Taxing Carbon?

Answer: It depends on how the tax revenues are recycled.

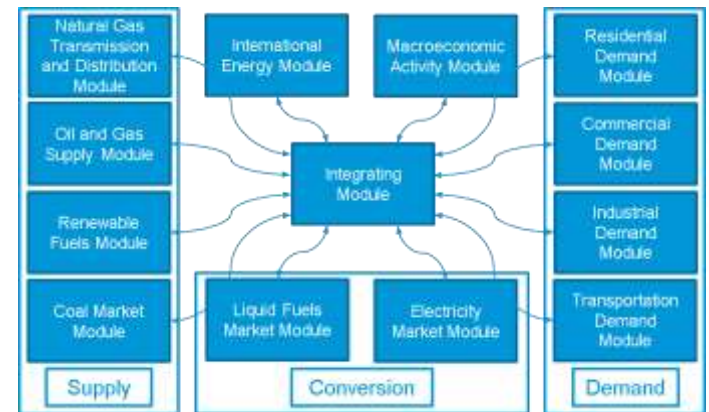


The Southeast would lose wealth from a household “carbon dividend.”

The Southeast’s carbon intensive economy would be saddled with high carbon taxes.

Recycling tax revenues on a per capita basis would result in a transfer of wealth from the Southeast to the West and Northeast.

Cutting taxes on wages would benefit Georgia’s cities.



The National Energy Modeling System





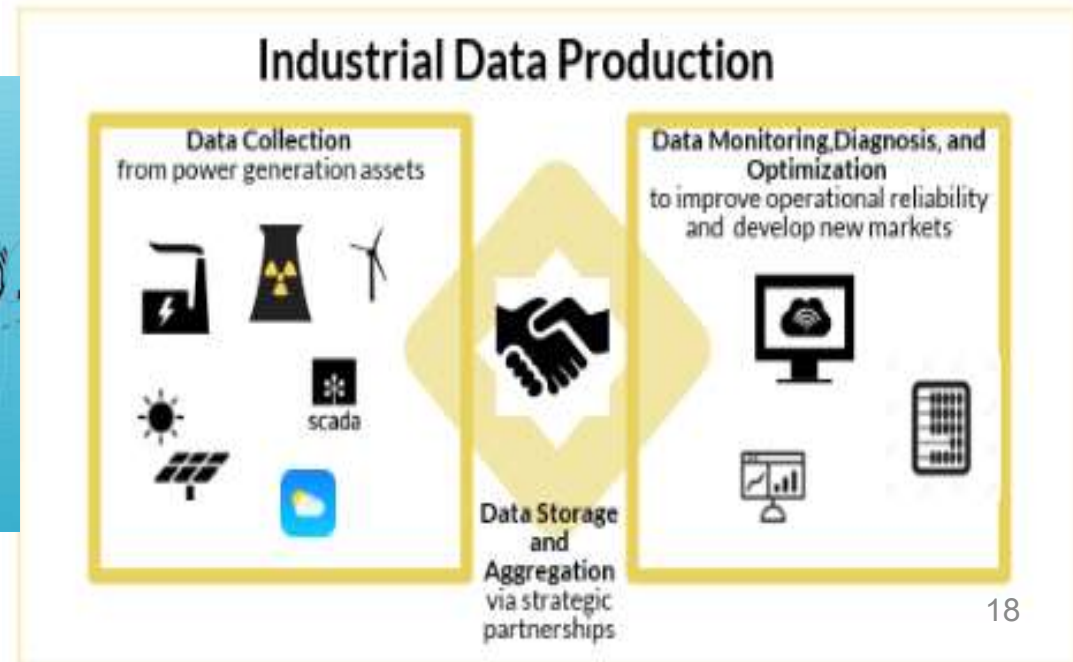
# Southeast USA

**Modeling** Energy Costs, Use and Impacts



# Industries Need High Fidelity Data and Models

- Lead the development of a governance framework for industrial data
- Support up-skilling in the regional labor market



18

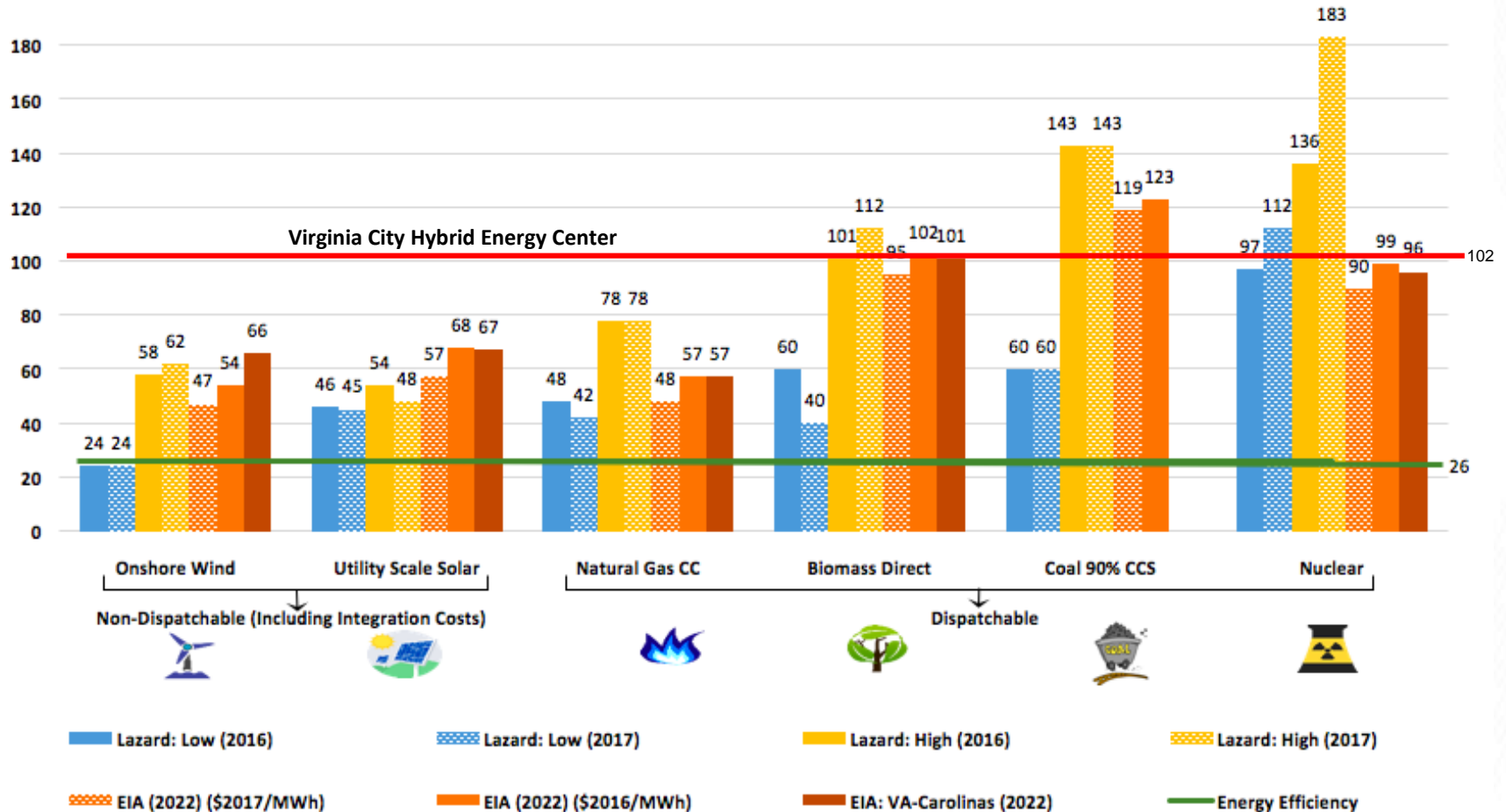


Jennifer Clark



# Why Are the Least-Cost Options Not Deployed?

Levelized Cost of Electricity (\$/MWh)



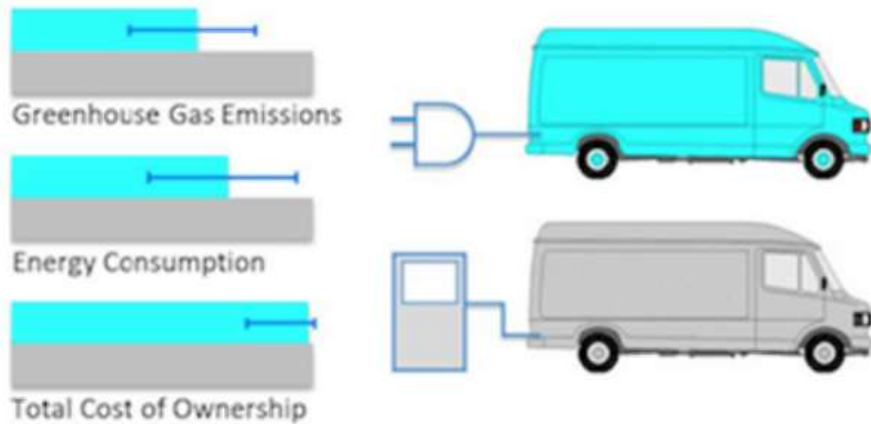


# The Nation

**Communicating** Policy Design and  
Implementation

# Atlanta's Emergence as a Warehousing Capital

Electric urban delivery trucks: energy use, GHGs & Cost



Center for Advancing Research in Transportation Energy, Emissions and Health



Machine Learning & Real-Time Intelligence in EV Infrastructure

Civic Data Science and Urban Sustainability

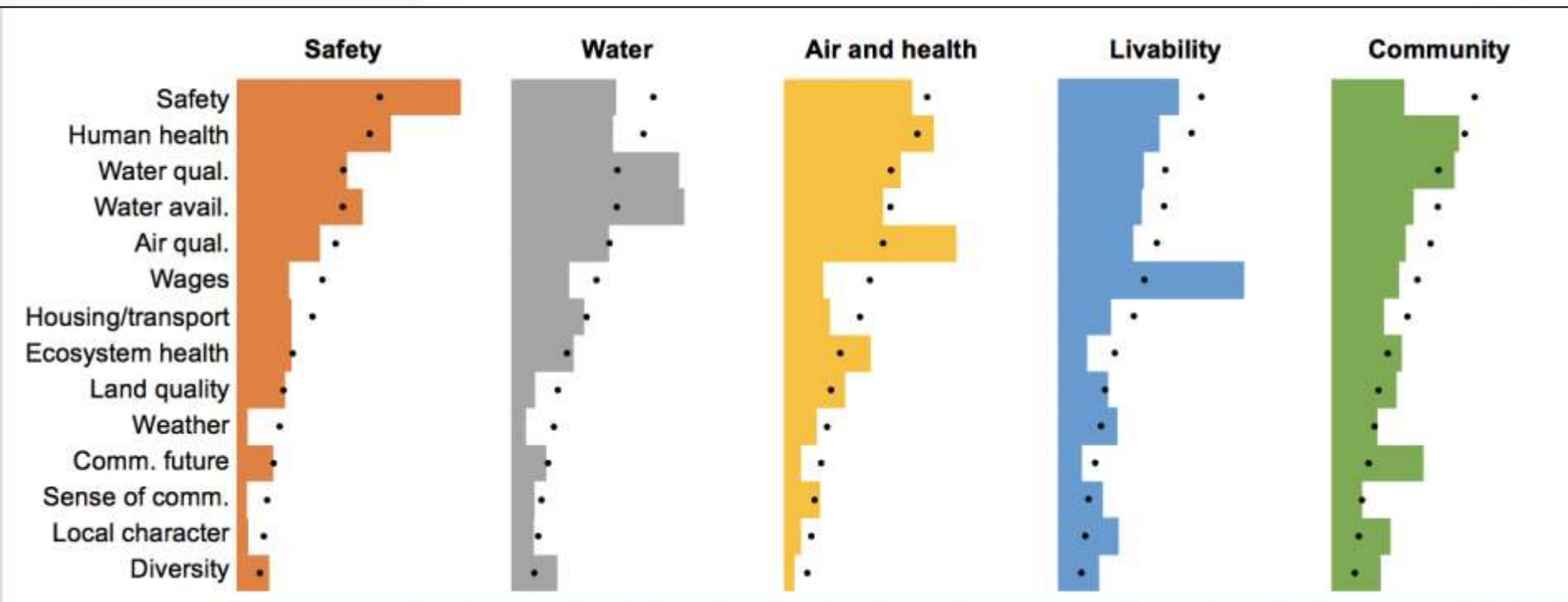
Freight Electrification



Valerie Thomas, Omar Asensio, Mike Rodgers & Marilyn Brown

# Valuing Non-market Costs & Benefits in Energy

- How do we include societal values when weighing multiple criteria in project decisions?
- How flexible is the US hydropower system, given the context of intermittent renewables?



Emily Grubert



# Globe

**Reaching** Collaborators, Stakeholders and  
Students Around the World



# Climate Mitigation Will Cause Redistribution of Investments

From fossil fuels to low-emission power & energy efficiency

	2010-2029				
	No. of studies	Median	Min	Mean	Max
<b>World</b>					
Total electricity generation	5	126.3	16.5	104.1	205.2
Renewables	5	85.4	-3.2	86.0	175.6
Nuclear	5	31.6	27.7	43.1	66.8
Power plants with CCS	5	29.8	6.3	40.7	117.2
Total fossil power plants	5	-29.7	-165.8	-65.6	-2.1
Extraction of fossil fuels	5	-55.9	-368.9	-115.7	8.3
Energy efficiency	4	335.7	0.8	328.3	641.0
R&D in energy sector*	3		4.5		78.0



# The Contested Role of Bio-energy in Carbon Futures

- Using markets for bio-energy to sequester carbon in forests
- Bio-energy with Carbon Capture and Storage and the role of negative emissions in future climate scenarios
- Potential complementarity of forest carbon sequestration and bio-energy expansion

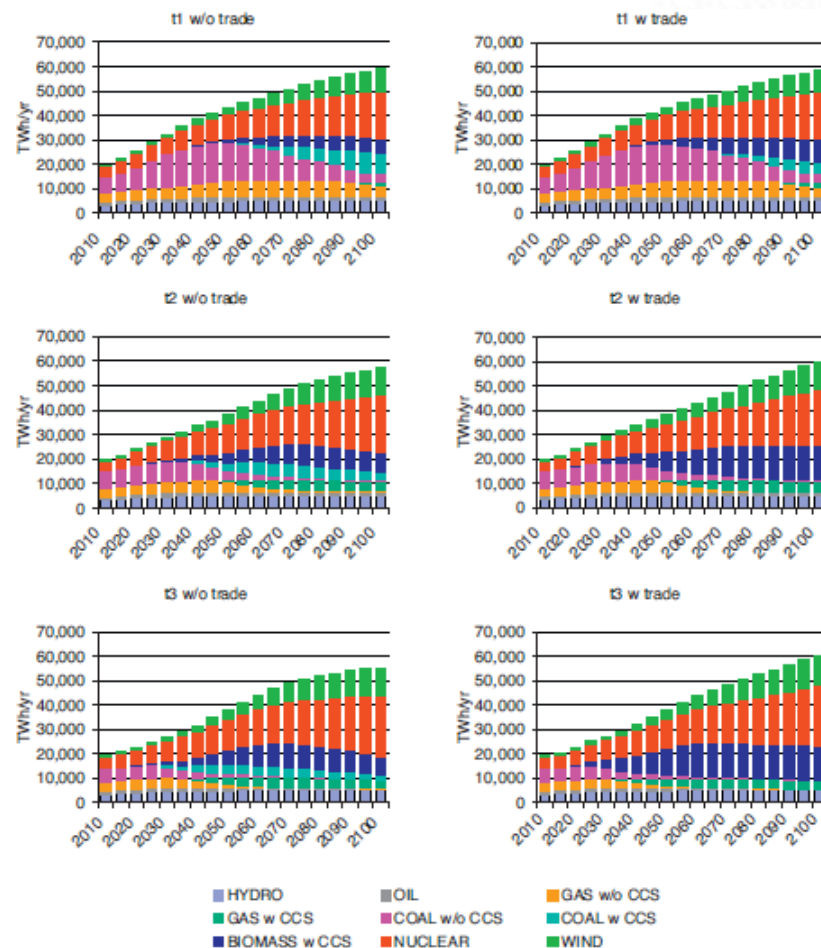


Fig. 7. Electricity generation by technology under three carbon tax scenarios with and without biomass trade. 25

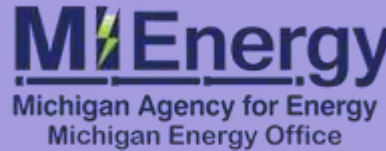


# Our E&E Graduates Are Making a Difference

## Universities



## Government



## Business



# Questions

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# Thank you!

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[marilyn.brown@pubpolicy.gatech.edu](mailto:marilyn.brown@pubpolicy.gatech.edu)



The background of the left side of the slide is a dark, olive-green color with a technical, industrial aesthetic. It features faint, semi-transparent images of mechanical parts, including what appears to be a large circular component with a grid pattern and various pipes and fittings. The Georgia Tech logo and tagline are overlaid on this background.

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**Extras**

# Our Connectedness and Interdisciplinarity



**Georgia Tech Energy Policy and Innovation Center**

**Georgia Tech Ray C. Anderson Center for Sustainable Business**  
Scheller College of Business

**Georgia Tech Center for Distributed Energy**



**Brook Byers Institute for Sustainable Systems**

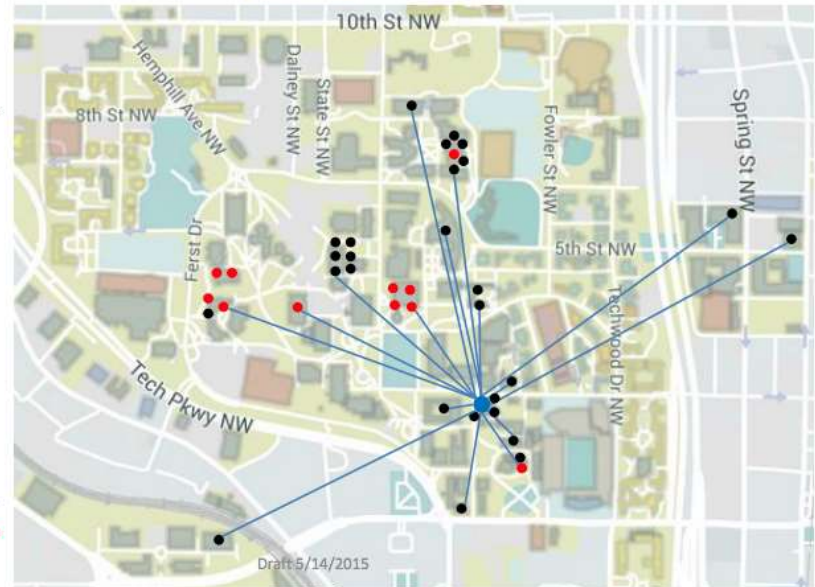
## ● Marilyn Brown

1. John Crittenden
2. Valerie Thomas
3. Santiago Grijalva
4. Richard Fujimoto
5. Tim Liewen
6. Ronald Harley
7. Tom Orlando
8. Aris Georgakakos
9. Miroslav Begovic
10. Joe Montoya
11. Peter Webster
12. Gleb Ushin
13. Pinar Keskinocak
14. Carlos Santamarina
15. Dan Matisoff
16. Lakshmi Sankar
17. Liang Peng
18. Michael Elliot
19. Bojan Petrovic
20. Leigh McCook
21. Elsa Retchmanis
22. Doug Noonan
23. Jennifer Clark
24. Rafael Bras
25. Julia Kubanek
26. Steve French
27. Deedee Bennett
28. Sam Graham
29. Monica Halka
30. Judy Curry
31. Ann Carpenter
32. Paul Baer
33. Hai-Ru Chang
34. Steve Cross
35. Shijie Deng
36. Jian Luo
37. Usha Nair-Reichert
38. Philip Roberts
39. Maryam Saeedifard
40. Terry Sturm
41. Huaming Yao

Direct Proposal Collaborations  
 Black = proposal only  
 Red = award



**Q: Where is Marilyn?**  
**A: Probably walking on campus!**



SPP has strong ties across campus, in part because of our interdisciplinarity.

# GT Study Abroad Program on Sustainable Development and Climate Change in Venice

- A 5-week, 6-credit program with two 3-credit courses on Climate Policy (PUBP 3320) and Sustainable Development (PUBP 3600).
- The Program offers a multi-disciplinary learning experience through a combination of in-class lectures, guest speakers and instructional field trips.
- Students have the opportunity to participate in lectures from experts on sustainable development and climate change.
- Five IPCC authors gave lectures during the program.



Dr. Antonio Navarra  
CMCC, Bologna



FAO, Rome



Professor Carlo Carraro  
H-Farm

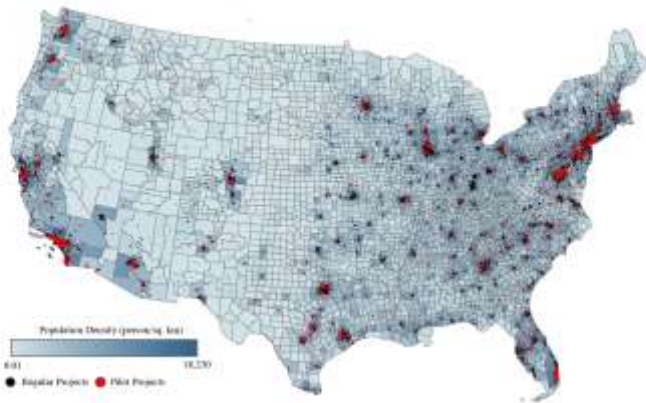
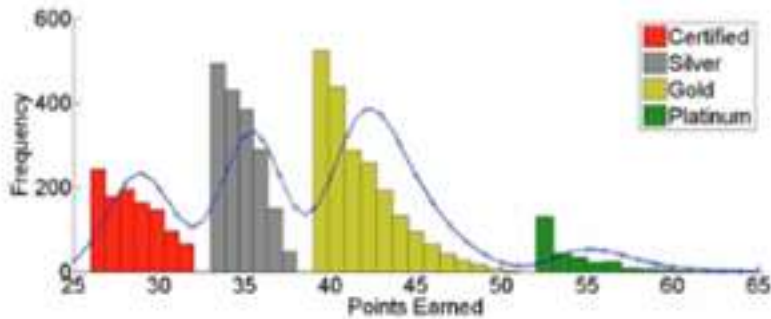


Dr. Massimo Tavoni  
Politecnico, Milan 31



# National E&E Policy Adoption and Affordability

- LEED construction optimizes metric, not sustainability
- Solar net metering causes rates to rise, harming poorer customers



Spatial Distribution of LEED Buildings

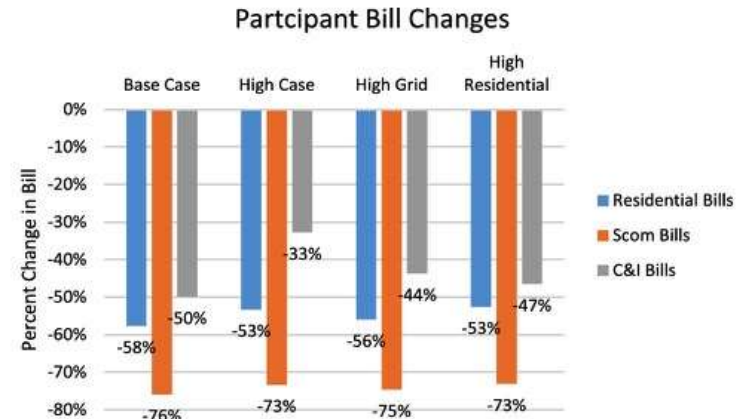


Fig. 4. Percent changes in participant bills: 2015 – 2030.

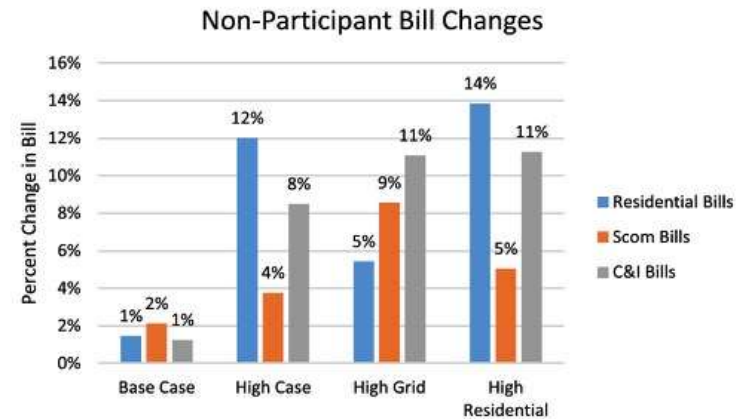


Fig. 5. Percent changes in non-participant bills: 2015 – 2030.



Dan Matisoff & Marilyn Brown